**Pre-ambulation /Test Socket Setup**

**Observation**

- **Sagittal Plane Alignment recommendations** not achieved in setup.
  
  *pylon vertical, 20mm posterior offset of main axis from sagittal plane reference line*

**Corrective Measure**

- **Socket Angle: Sagittal Plane**
  
  - Accommodates contracture + 3-5° of flexion
  - Ensure hip flexor activation/stretch occurs after forefoot loading on prosthetic side
  - *Translate* knee posterior to achieve required offset

**Initial-Ambulation Assessment**

**Observation**

- **Assistive Device Usage**
  
  - **Crutch or Cane** on uninvolved side =
    - lean to device side
  - **Walker** =
    - forward trunk lean
  - **Parallel bars** =
    - forward trunk lean
    - device used for partial weight support

- **Poor Proprioception**
  
  Unawareness of knee reaching full extension in swing phase

- **Gait and postural deviations during Ambulation**
  
  Misaligned Posture (e.g. Lordosis etc when ambulating)
  
  - Weight Shifting
  - Vaulting
  - Hip Hiking
  - Uneven step lengths
  - Passive hip extensors

**Corrective Measure**

- **Device & Amputee Corrections**
  
  - **Crutch or Cane**
    - Switch to usage on involved side
  - **Walker**
    - Cue activation of abdominal and gluteal muscles
  - **Parallel bars** =
    - Cue activation of abdominal and gluteal muscles
    - Cue to reduce use of bars for weight support

- **Knee Adjustment**

  - **Increase terminal impact**
    - Switch from white to red spring
    - If friction was increased, reduce, but no further than factory setting.

- **Amputee Correction**

  - Cue activation of abdominal and gluteal muscles
Specific/Key Examples

Observation: New patient/K2/using walker
- Leaning forward, butt out.
- Walker used for weight support
- Weak hip flexors

Corrective Measure: Amputee Corrective Measure
- Cue amputee to awareness of current posture
- Then cue to activate core

Knee Adjustment: Knee Adjustment
- Remove friction mechanism
- Install Red (high) Spring

Observation: K2 transitioning from WASC
- Possible postural deficits
- Possible delayed prosthetic heel strike

Corrective Measure: Amputee Corrective Measure
- Cue awareness of current posture
- Then cue to activate core

Knee Adjustment: Knee Adjustment
- Remove friction mechanism
- Install Red Spring

Observation: High Activity Patient acclimated to MPK or S&S Knee

Corrective Measure: Amputee Corrective Measure
- Communicate adaptation period to Knee’s lower resistance to flexion which will result in natural reduction in hip flexor force over time.
- Active musculoskeletal activity throughout stance phase will be more energy efficient and promote proper usage of knee

Knee Adjustment: Knee Adjustment
- Red Spring
- Increase Friction

Observation: K2 acclimated to geometric locking or polycentric knees
- Non-sequential disengagement of knee
- Lack of trust in prosthesis

Corrective Measure: Amputee Corrective Measure
- Communicate sequential steps of ATK disengagement

Knee Adjustment: Knee Adjustment
- Red Spring
- Remove Friction

Observation: K3 acclimated to geometric locking hydraulic swing knees
- Possible acclimation to greater flexion resistance

Corrective Measure: Knee Adjustment
- Increase friction resistance
**Amputation Levels**

**Observation**

**KD or Long TF**
- Good hip flexor/extensor control
- High level of prosthetic knee swing phase extension force

**Communicate:**
- Less hip flexor force needed.
- Natural acclimation will occur

**Bilateral TF**
- Inability or difficulty:
  - sit to stand
  - stand to sit
- Poor Balance
  - Inclination to lean back in parallel bars
  - Inclination to keep hands in line with or behind pelvis on bars

**Communicate:**
- Manual lock methods of engagement
  - Cover Release
  - Autolock function
- Practice standing in manual lock mode
- Practice sitting, unlocking and using cover release bilaterally
- Focus on correcting posterior leaning posture in parallel bars
- Practice static weight shifting side to side
- Practice static weight shifting front to back (back toe lined up with heel of other foot) while cueing correct posture
- Walk in parallel bars with both knees manually locked.
- Practice strong hip flexion by kicking bottle with other knee manually locked, switch sides

**Knee setup:** Red Spring, remove Friction Mechanism

**Bilateral:** **TF + TT**
- Often favor TF side if knee stable due to discomfort w/ loading TT side anatomical knee

**Amputee Correction**

**If TF first:** generally quick progression
**If TT first:** must master TF mechanics without ability to favor other side.
**Will need to develop strong ability to use & trust TF side**
Communicate:
Manual lock methods of engagement
Cover Release
Autolock function
• Practice standing in manual lock mode
• Practice sitting: load toe by twisting trunk, or sit with leg extended, unlocking and using cover release
• Practice static weight shifting side to side
• Practice static weight shifting front to back (back toe lined up with heel of other foot) while cueing correct posture
• Walk in parallel bars with knee manually locked.

Knee setup:
Alignment
The further posterior the knee center from the sagittal reference line, the easier it will be for the amputee to initiate flexion.

Alignment/placement of main axis of knee in sagittal plane must allow effective loading of toe prior to desired initiation point of stance phase knee flexion.

Swing Phase Settings
Most HDs will want a more free swinging knee
• white spring w factory friction
• white spring w/o Friction Mechanism
• red spring if insufficient pendulum effect with white spring

Hip Disarticulation
Inability or difficulty:
• sit to stand
• stand to sit
Poor Balance
Lack extremity to control prosthesis

Observation
Corrective Measure
Pre-fitting Patient Hx Assessment

All Cases → Observation → Probable Action

Age/Mobility Level

Pre-Amputation activity level predictor of potential
**High mobility:** greater functional potential, strength, balance, need for variable cadence response
**Low mobility:** reduced strength and balance need for assistive device, need for stability, need for robust extension

Probable Action

High Mobility:
- Increase to red spring
- Increase friction

Low Mobility:
- Increase to red spring
- Remove Friction unit

Amputation Level & Type

**Short TF** = poor hip flexor extensor control

**Long TF/KD:** good hip flexor/extensor control / long lever arm

Note A/P but also ROM / M/L strength / stabilization (likely myoplasty)

Probable Action

**Short TF:**
- Minimal friction or removal of friction mechanism. possible increase to red spring

**Long TF/KD:**
- Increase to red spring
- Increase friction

Time Since Amputation

Newer Amputee
- Socket fit may be variable
- Assure stump weight bearing capability

Probable Action

Ensure has distal contact w socket. if one way valve, open and palpate to assess.

If not, and time permits, have amputee ace-wrap or apply shrinker for 15-30 minutes prior to redonning

If distal and/or proximal discomfort, have patient try added sock ply.

Sealing liners - ensure proper sock and/or sealing fin placement on liner
Pre-fitting Patient Hx Assessment, Cont’d

All Cases

Observation

Probable Action

Cognitive Level / Mental Fatigue

Lack of understanding of:
- autolock at extension
- Autolock release requirements

- Education on AutoLock engagement and release
- use of simple cues understandable to amputee
- Practice stationary unloading
- Loosen friction
- Take breaks if mental fatigue

Hx of:
- Falls
- Gait Deviations
- Compliance

Determine reason for falls:
- Cognitive issues
- Noncompliance
- Balance issues
- Hip extensor weakness
- Hip Flexion Contracture
- Contralateral deficits
- Inappropriate component
- Selection
- Insufficient PT post-amputation

- Educate on function and importance of gait pattern required
- Ensure compensatory alignment modifications if needed (socket flexion while maintaining knee offset). Ensure patient is actually capable of exploiting functions of knee.

Other Comorbidities

- Cardiovascular capability
- Stump health & socket comfort
- Neurological involvement

- Verify patient capability to ambulate without health risk and determine steps and rest sessions as needed
- Neuromas and localized stump pain independent of socket fit - determine if limits patient's ability to ambulate, influences specific parts of gait cycle.

Contralateral Side Involvement / Muscle Strength

AKA/BKA
- Compromised sound side-orthopedic or neurological related
- How much time spent inactive as an amputee
- complications of amputation process

- See Bilateral considerations under "Key Examples"
- Note affects of contralateral deficits on proper execution of knee (e.g. step length)
- adjust alignment if needed to compensate.
- Note A/P & M/L strength/stabilization (likely myoplasty) and ROM